



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/554,380	09/29/2006	Takuma Hojo	SHIGA7.032APC	7236
20995 7590 01/11/2008 KNOBBE MARTENS OLSON & BEAR LLP 2040 MAIN STREET FOURTEENTH FLOOR IRVINE, CA 92614			EXAMINER EOFF, ANCA	
			ART UNIT 1795	PAPER NUMBER
			NOTIFICATION DATE 01/11/2008	DELIVERY MODE ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

jcartee@kmob.com
eOAPilot@kmob.com

Office Action Summary

Application No.

10/554,380

Applicant(s)

HOJO ET AL.

Examiner

Anca Eoff

Art Unit

1795

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on 10 December 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1 and 3-13 is/are rejected.
- 7) ☒ Claim(s) 2 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____

- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

1. The foreign priority document JP 2003-125241 filed on April 30, 2003 was received and acknowledged. However, in order to benefit of the earlier filing date, a certified English translation is required.
2. Claims 1-13 are pending in the application.

Claim Rejections - 35 USC § 102

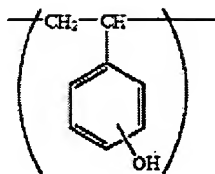
3. The following is a quotation of the appropriate paragraph of 35 U.S.C. 102 that forms the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

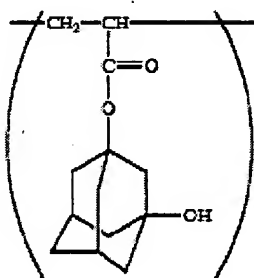
(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1, 5-8, 10 and 12 are rejected under 35 U.S.C. 102(b) as being anticipated by Uetani et al. (WO 2001/73512, wherein the citations are from the English equivalent US Pg-Pub 2003/0113661).

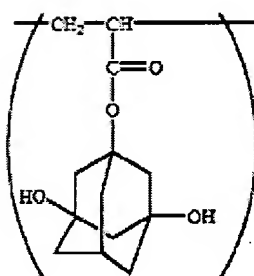
With regard to claim 1, Uetani et al. disclose a chemical amplification type positive resist composition comprising a resin and an acid generator (abstract). The resin component has essentially two polymerization units: a polymerization unit of hydroxystyrene (represented by formula (1) below) and at least one polymerization unit selected from a polymerization unit of 3-hydroxy-1-adamantyl acrylate (represented by the formula (2) below) and 3,5-dihydroxy-1-adamantyl (meth)acrylate (represented by the formulas (3) and (4) below) (par.0008):



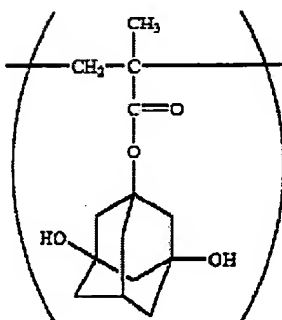
(1)



(2)



(3)



(4)

(formulas (I), (IIa), (IIb), (IIc) in par.0008).

Uetani et al. further disclose that when a copolymer of hydroxystyrene/at least one selected from 3-hydroxy-1-adamantyl acrylate and 3,5-dihydroxy-1-adamantyl (meth)acrylate is reacted with a compound for introducing an acid-unstable group, a protective group can be introduced on a hydroxyl group in at least one selected from 3-hydroxy-1-adamantyl acrylate and 3,5-dihydroxy-1-adamantyl (meth)acrylate together with a hydroxyl group in a hydroxystyrene unit (par.0025).

The copolymer of hydroxystyrene and at least one of the compounds represented by formulas (2), (3) and (4) which have a portion of the hydroxyl groups protected by a protective group, as disclosed in par.0025 of Uetani et al. is equivalent with the component (A) of the instant application. The hydroxystyrene polymerization unit of Uetani et al. is equivalent to the structural unit (a1) and at least of the polymerization unit of formulas (2),(3) and (4) is equivalent to the structural unit (a2) of the instant application.

Uetani et al. further disclose that the chemically amplified positive resist comprises a solvent (par.0087).

With regard to claim 5 and 6, Uetani et al. disclose that the unit derived from the (meth) acrylate ester comprises an adamantyl group having an alcohol hydroxyl group (see formulas (2), (3) and (4) above).

With regard to claim 7, Uetani et al. further disclose a copolymer of hydroxystyrene and 3-hydroxy-1-adamantyl acrylate (par. 0090-par.0094).

With regard to claim 8, Uetani et al. further disclose that the group unstable to an acid for protecting the hydroxyl group could be a group such as 1-ethoxyethyl, 1-isopropoxyethyl group (par.0013).

With regard to claim 10, Uetani et al. further disclose that the polydispersity of a copolymer of hydroxystyrene and 3-hydroxy-1-adamantyl acrylate (compound of formula (2) above) is 1.77 (par.0091).

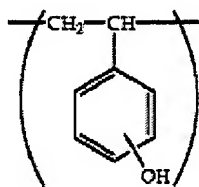
With regard to claim 12, Uetani et al. disclose a process of forming a resist pattern, comprising the following steps:

- applying the resist composition in form of a resist solution on a substrate (par.0087, par.0088);
- drying/pre-baking (par.0088);
- exposing to radiation (par.0088);
- performing a heating treatment to accelerate de-protecting group reaction (post-exposure bake, PEB) (par.0088);
- developing with an alkali developer (par.0088).

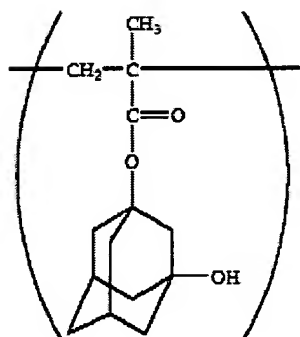
While Uetani et al. do not specifically disclose a step of exposing the resist film using an electron beam, it is disclosed that the acid generator used in the resist composition is a substance which is decomposed to generate an acid under the action of light or electron beams (par.0026) and, because the acid generator can be activated by electron beam to generate acid, the resist can be used for imaging with electron beams.

5. Claims 1, 4-6, 9 and 12 are rejected under 35 U.S.C. 102(b) as anticipated by Uetani et al. (WO 2000/46640 wherein the citations are from the English equivalent document, US Patent 6,627,381).

With regard to claim 1, Uetani et al. disclose a chemical amplification type positive resist composition comprising a resin and an acid generating agent (abstract). The resin comprising a polymerization unit derived from hydroxystyrene (formula (5) below) and a polymerization unit derived from 3-hydroxy-1-adamantyl methacrylate (formula (6) below):



(5)



(6)(column 2, lines 17-50).

Uetani et al. further disclose that a hydroxystyrene/3-hydroxy-1-adamantyl methacrylate copolymer is reacted with a compound for introducing an acid-unstable group and a protective group may be introduced not only to the hydroxyl group of the

hydroxystyrene unit but also to the hydroxyl group of the 3-hydroxy-1-adamantyl methacrylate (column 5, line 63- column 6, line 4).

The hydroxystyrene/3-hydroxy-1-adamantyl methacrylate copolymer is equivalent to the component (A) of the instant application.

Uetani et al. further disclose that the chemically amplified positive resist comprises a solvent (column 8, line 25).

With regard to claim 4, Uetani et al. further disclose that the molar ratio of hydroxystyrene polymerization unit (equivalent with structural unit (a1) of the instant application) and the 3-hydroxyl-1-adamantyl methacrylate (equivalent to the structural unit (a2) of the instant application) is 90.1: 9.9 (column 9, lines 51-53).

With regard to claims 5-6, Uetani et al. disclose that the unit derived from the methacrylate ester comprises an adamantyl group having an alcohol hydroxyl group (see formula (6) above).

With regard to claim 9, Uetani et al. further disclose that the resin component may further comprises other polymerization units, such as styrene (column 5, lines 45-46), equivalent to the structural unit (a3) of the instant application.

With regard to claim 12, Uetani et al. disclose a process of forming a resist pattern, comprising the following steps:

- applying the resist composition in form of a resist solution on a substrate;
- drying/pre-baking ;
- exposing to light for patterning;

- performing a heating treatment (PEB) to accelerate a protective group-eliminating reaction, and

- developing with an alkali developer (column 8, lines 24-47)).

While Uetani et al. do not specifically disclose a step of exposing the resist film using an electron beam, it is disclosed that the acid generator used in the resist composition is a substance which is decomposed to generate an acid under the action of light or electron beams (column 6, lines 9-13) and, because the acid generator can be activated by electron beam to generate acid, the resist can be used for imaging with electron beams.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Uetani et al. (WO 2001/73512, wherein the citations are from the English equivalent US Pg-Pub 2003/0113661).

With regard to claim 3, Uetani et al. further disclose that the amount of a polymerization unit having a group unstable to an acid (hydroxyl groups protected with acid dissociable group of the instant application) is between 10% and 45% (par.0024).

Uetani et al. disclose that "When a copolymer of hydroxystyrene/at least one selected from 3-hydroxy-1-adamantyl acrylate and 3,5-dihydroxy-1-adamatyl (meth)acrylate is reacted with a compound for introducing an acid-unstable group, for example di-tert-butyl dicarbonate or an unsaturated ether compound of the formula $R^5-C(R^4)=CH-O-R^2$, a protective group can be introduced also on a hydroxyl in at least one selected from 3-hydroxy-1-adamantyl acrylate and 3,5-dihydroxy-1-adamatyl (meth)acrylate, together with a hydroxyl group in a hydroxystyrene unit. In the case of presence of such a group in which a hydroxyl group in at least one selected from 3-hydroxy-1-adamantyl acrylate and 3,5-dihydroxy-1-adamatyl (meth)acrylate is protected with a group unstable to an acid, it is reasonable to think that this unit is included in polymerization units having a group unstable to an acid "(par.0025, the unsaturated ether formula being disclosed in par.0019).

While Uetani et al. do not clearly shows a copolymer having acid-unstable groups in both the 4-hydroxystyrene unit and the unit selected from 3-hydroxy-1-adamantyl acrylate and 3,5-dihydroxy-1-adamatyl (meth)acrylate, it would have been obvious to one of ordinary skill in the art at the time of the invention to obtain a copolymer having acid-unstable groups in both of the components, based on the teachings of Uetani et al. shown above.

8. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Uetani et al. (WO 2001/73512, wherein the citations are from the English equivalent US Pg-Pub 2003/0113661) in view of Ichikawa et al. (US Patent 6,153,349).

With regard to claims 1 and 11, Uetani et al. disclose a chemically amplified positive resist comprising a resin, an acid generator (abstract) and a quencher, in order improve the performance of the resist that might deteriorate due to the deactivation the acid left after exposure (par.0084). Uetani et al. further disclose that the quencher is a nitrogen-containing compound, such as an amine (par.0084) but fail to include a secondary or tertiary aliphatic amine containing alkyl groups with 7 to 15 carbon atoms as a quencher that could be used for the chemically amplified resist.

Ichikawa et al. disclose a photoresist comprising a resin having structural units derived from hydroxystyrene and hydroxystyrene with the hydroxyl group protected by acid-unstable groups (see abstract). The chemical amplification type photoresist comprising a quencher, that could be a secondary amine (diheptylamine, dioctylamine, dinonylamine), a tertiary amine (triheptylamine, trioctylamine, trinonylamine). The quencher is added to the photoresist to improve the performance deteriorated by deactivation of the acid allowed to stand after light exposure (column 11, lines 6-30).

Since the secondary and tertiary amines comprising alkyl groups with 7 to 15 carbon atoms used as quenchers in Ichikawa et al. (column 11, lines 6-10) perform the same function required for the quenchers of Uetani et al. (par.0084), it would have been obvious for one of ordinary skill in the art to use the secondary and tertiary amines comprising alkyl groups with 7 to 15 carbon atoms as disclosed by Ichikawa et al. as quenchers in the composition of Uetani et al.

9. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Uetani et al. (WO 2001/73512, wherein the citations are from the English equivalent US Pg-Pub 2003/0113661) in view of Ishibashi et al. (US Patent 6,579,657).

With regard to claims 12 and 13, Uetani et al. disclose a process of forming a pattern comprising a step of applying the resist on the substrate, drying, exposing, performing a post-exposure bake and developing (par.0088) as applied to claim 12 but fail to disclose a step of narrowing the spacing of the resist pattern as required by claim 13.

Ishibashi et al. disclose that a resist pattern containing a material capable of generating an acid by exposure to light is covered with a resist containing a material capable of crosslinkage in the presence of an acid. The acid is generated in the resist pattern by application of heat or by exposure by light, and a crosslinked layer is formed at the interface as a cover layer for the resist pattern, thereby causing the resist pattern to be thickened and the hole diameter or the isolation width of a resist pattern can be reduced (abstract). The resist of Ishibashi et al. could be a positive or a negative type resist (disclosed as "first resist" by Ishibashi et al., column 5, lines 19-21). The material that covers the resist pattern (disclosed as "fine-pattern forming material" or "second resist" by Ishibashi et al.) comprises a water-soluble polymer (column 2, lines 1-3).

A first resist pattern is formed on a substrate (column 5, lines 25-40) then a second resist is coated onto the first resist pattern (column 5, line 55) and it is pre-baked (column 5, line 60) and then mixing-baked so the crosslinking reaction takes place in the second resist (column 5, line 62-column 6, line 9).

Ishibashi et al. do not disclose the shrinking of the water-soluble polymer layer but, since they disclose as water-soluble polymer/"second resist" material the same compounds as the instant application (page 27 of the specification) and absent a record to prove the contrary, it is the examiner's position that the shrinkage of the water-soluble polymer occurs during the heating step.

By this method, a finely isolated pattern is formed, which is desirable for the manufacturing of highly integrated semiconductor devices and interconnection with very fine widths (column 1, lines 9-22).

Since Uetani et al. indicate the use of the chemically amplified resist in the production of integrated circuits and submicron pattern formation (par.0002), it would have been obvious for one of ordinary skill in the art at the time of the invention to perform the pattern-thickening process disclosed by Ishibashi et al. (applying a water-soluble polymer coating on the resist pattern and mix-baking to crosslink the water-soluble polymer and thicken the resist) following the process of forming a resist pattern disclosed by Uetani et al., in order to obtain a pattern with reduce hole diameter /isolation width (Ishibashi et al, abstract).

Allowable subject matter

10. Claim 2 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Uetani et al. (WO 2001/73512, wherein the citations are from the English equivalent US Pg-Pub 2003/0113661) disclose a copolymer of 4-hydroxy styrene and 3-hydroxy-1-adamantyl acrylate with a weight average molecular weight of 11,400 (par.0091).

Uetani et al. (WO 2000/46640 wherein the citations are from the English equivalent document, US Patent 6,627,381) disclose a copolymer of 4-hydroxy styrene and 3-hydroxy-1-adamantyl methacrylate with a weight average molecular weight of 9,800 (Synthesis Example 1 in column 9, lines 45-49).

Terminal Disclaimer

11. The terminal disclaimer filed on December 10, 2007 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of the fully statutory term of any patent issuing from the US Patent Applications 10/572,709, 10/550,056 and 10/865,040 has been reviewed and is accepted. The terminal disclaimer has been recorded.

Response to Arguments

12. Applicant's arguments filed on December 10, 2007 have been fully considered but they are not persuasive.

On page 6 of the Remarks, the applicant argues that the Uetani references fail to teach that both the hydroxyl groups of (a1) and the alcoholic hydroxyl groups of (a2) are partially protected by acid dissociable dissolution inhibiting groups.

The examiner would like to show that Uetani et al. (WO 2001/73512, wherein the citations are from the English equivalent US Pg-Pub 2003/0113661) clearly teach that "When a copolymer of hydroxystyrene/at least one selected from 3-hydroxy-1-adamantyl acrylate and 3,5-dihydroxy-1-adamantyl (meth)acrylate is reacted with a compound for introducing an acid-unstable group, for example di-tert-butyl dicarbonate or an unsaturated ether compound of the formula $R^5-C(R^4)=CH-O-R^2$, a protective group can be introduced also on a hydroxyl in at least one selected from from 3-hydroxy-1-adamantyl acrylate and 3,5-dihydroxy-1-adamantyl (meth)acrylate, together with a hydroxyl group in a hydroxystyrene unit " (par.0025, the unsaturated ether formula being disclosed in par.0019).

The examiner would also like to show that Uetani et al. (WO 2000/46640 wherein the citations are from the English equivalent document, US Patent 6,627,381) clearly teach that "In the case where the hydroxystyrene/3-hydroxy-1-adamantyl methacrylate copolymer is reacted with a compound which is for introducing an acid-unstable group, such as di-tert-butyl dicarbonate or an unsaturated ether compound of the formula $R^5-C(R^4)=CH-O-R^2$, a protective group can be introduced not only to the hydroxyl group of the hydroxystyrene unit but also to the hydroxyl group of the 3-hydroxy-1-adamantyl methacrylate unit (column 5, line 63-column 6, line 4, with the formula of the unsaturated ether compound being disclosed in column 4, lines 40-45).

Conclusion

14. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anca Eoff whose telephone number is 571-272-9810. The examiner can normally be reached on Monday-Friday, 6:30 AM-4:00 PM, EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on 571-272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only.

Application/Control Number:
10/554,380
Art Unit: 1795

Page 16

For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

AE
AE

Cynthia Kelly